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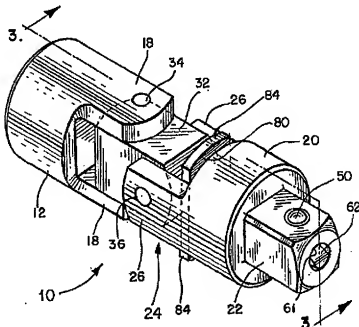
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: **UNIVERSAL JOINT FOR TORQUE TRANSMITTING TOOLS**

## (57) Abstract

A socket wrench universal joint (10) includes a socket engaging element (50) movably mounted in the drive stud (22) of the universal joint to engage a socket (S). An actuator (80) is mounted to the universal joint for manipulation by a user, and a linking element (60) links the actuator and the socket engaging element. The actuator allows the user to alter the socket retaining forces. In a quick release version, the operator can release a socket (S) from the drive stud (22) of the universal joint by appropriately manipulating the actuator (80°). In another version, the user can enhance socket retaining forces by properly manipulating the actuator (80°).



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## UNIVERSAL JOINT FOR TORQUE TRANSMITTING TOOLS

### Background of the Invention

This invention relates to a universal joint of the type comprising first and second parts, wherein the first part defines a recess configured to receive a drive stud of a torque transmitting tool and the second part comprises a drive stud configured to engage a tool head. At least one coupling element is positioned between the first and second parts to transmit torque therebetween while allowing the first and second parts to rotate with the first part positioned in a skew orientation with respect to the second part.

Universal joints of this type are in common use with torque transmitting tools such as socket wrenches. See for example the constant velocity type universal joint described in Hazebrook U.S. Patent 4,941,862. Conventional universal joints include a spring biased detent ball on the drive stud that engages the recess of the tool head that is mounted to the universal joint to provide a retention force that cannot be readily altered or selected by the user.

This arrangement is not without disadvantages. In particular, on some occasions it would be preferable if a tool head were held in place in the drive stud more securely and more positively. On other occasions it would be preferable if a tool head could be released from the drive stud so as to drop freely

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from the drive stud and allow one hand removal of the tool head mounted on the drive stud.

#### Summary of the Invention

The present invention is directed to an improved universal joint that allows a user to control tool head retention forces manually.

According to this invention, a universal joint of the type described initially above is provided with an engaging element movably mounted in the drive stud of the second part to engage the tool head when in an engaging position and to release the tool head when in a releasing position. An actuator is mounted to one of the first and second parts for manipulation by a user between first and second positions. A linking element is movable by the actuator and is coupled to the engaging element to alter effectiveness of the engaging element in retaining a tool head on the drive stud of the second part, thereby allowing the user to control said retention forces manually.

In a first group of embodiments the linking element accommodates movement of the tool head engaging element to allow the user to release the tool head from the second part by moving the actuator to the first position. The quick release embodiments of this invention described below allow one hand removal of a tool head from a universal joint. The user can simply manipulate the actuator to release the tool head from the drive stud of the universal joint, allowing the tool head to fall from the drive stud.

In a second group of embodiments the linking element is configured to allow the tool head engaging element to move to the releasing position when the actuator is moved to the first position, and to hold the tool head engaging element in the engaging position when the actuator is moved to the second position to retain the tool head on the drive stud of the second

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part more securely when the actuator is moved to the second position. These embodiments allow a user selectively to enhance retention of a tool head on the drive stud of the universal joint, again by manipulating the actuator. This can be useful in situations where the user wishes to guard against inadvertent removal of the tool head from the universal joint during use.

The invention itself, together with further objects and attendant advantages, will best be understood by reference to the following detailed description, taken in conjunction with the accompanying drawings.

#### Brief Description of the Drawings

Figure 1 is a perspective view of a universal joint which incorporates a first preferred embodiment of this invention.

Figure 2 is a side view in partial cutaway showing the universal joint of Figure 1 mounted to a socket wrench and to a socket.

Figure 3 is a view in partial cutaway and partial section taken along line 3-3 of Figure 1, showing the socket engaging element in the engaging position.

Figure 4 is a cross-sectional view taken along line 4-4 of Figure 3.

Figure 5 is a fragmentary cross-sectional view corresponding to Figure 3, showing the socket engaging element in the releasing position.

Figure 6 is a fragmentary cross-sectional view of a second preferred embodiment which utilizes a circumferential ramp.

Figure 7 is a cross-sectional view taken along line 7-7 of Figure 6.

Figure 8 is a cross-sectional view taken along line 8-8 of Figure 6.

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Figure 9 is a fragmentary cross-sectional view of a third preferred embodiment of this invention.

Figure 10 is a cross-sectional view taken along line 10-10 of Figure 8, showing the element 80" shifted in the direction of the arrows.

Figure 11 is a cross-sectional view corresponding to Figure 10, showing the element 80" shifted in the direction of the arrows.

Figure 12 is a fragmentary cross-sectional view taken along line 12-12 of Figure 11.

Figure 13 is a cross-sectional view of a fourth preferred embodiment of this invention.

Figure 14 is a partial cross-sectional view taken along line 14-14 of Figure 13.

Figure 15 is a fragmentary cross-sectional view taken along line 15-15 of Figure 14.

#### Detailed Description of the Presently Preferred Embodiments

Turning now to the drawings, Figures 1-4 provide various views of a first preferred embodiment of the universal joint of this invention. The universal joint 10 includes a first part 12 and a second part 20. The first part 12 defines a recess 14 shaped to receive the drive stud D of a torque transmitting tool, which in this example is a socket wrench W with an extension bar (Figure 2). As used herein, the term "torque transmitting tool" is intended to encompass the full range of tools for transmitting torque, including but not limited to socket wrenches, extension bars, T-bars, braces, as well as other hand and power tools. The first part 12 also defines a first joint portion 16 which includes two spaced, parallel arms 18.

The second part 20 includes a drive stud 22 shaped to engage a tool head such as a socket S, which is in turn configured to engage a workpiece such as a hexagonal bolt head or nut or other nonround workpiece